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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/602,755	06/24/2003	Zhen Yu Yang	CL1459 USDIV	9985

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EXAMINER

HU, HENRY S

ART UNIT	PAPER NUMBER
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1713

DATE MAILED: 04/21/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/602,755

Applicant(s)

YANG, ZHEN YU

Examiner

Henry S. Hu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on Election of March 23, 2005.
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 4-17 is/are pending in the application.
4a) Of the above claim(s) 9-12 is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 4-8 and 13-17 is/are rejected.
7) ☒ Claim(s) 4,13 and 16 is/are objected to.
8) ☒ Claim(s) 4-17 are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 3 pages.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This Office Action is in response to the faxed Election filed on March 23, 2005.

Applicant's election of Group I (Claims 4-8 and 13-17) with the species X being

$-N^+(M^+)SO_2R_f$ is traversed with remarks on page 1. The traversal is on the ground(s) that it would not place an undue burden to search and examine the non-elected Group II (Claims 9-12 and 13-17) with the elected Group I since they are so closely related in the field ionomers. This is not found persuasive because each of Group I and Group II is drawn to a technology apparently requiring search in different classification area. In the instant case Group I was drawn to a copolymer comprising repeating units of VDF and $CH_2=CH-(CF_2)_{2n}-O-CF_2CF_2-SO_2-$ X, while Group II was drawn to a different copolymer comprising repeating units of ethylene, tetrafluoroethylene and $CH_2=CH-(CF_2)_{2n}-O-CF_2CF_2-SO_2-X$.

As discussed earlier, process Groups II and I are actually two different ionic polymers due to the presence or absence of other monomeric components. Therefore, the scope of the claims, i.e., the metes and boundaries are distinct.

The requirement is still deemed proper and is therefore made **FINAL**. In summary, this application contains original **Claims 9-12 and 13-17**, which is drawn to an invention non-elected with traverse. A complete reply to the final rejection must include **cancellation of non-elected claims** or other appropriate action (37 CFR 1.144) See MPEP § 821.01. **Claims 4-17 are**

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pending now, the nonelected **Claims 9-12** are withdrawn from consideration, while the species **X** being $-N^-(M^+)SO_2R_f$. An action follows.

Specification

2. The disclosure is objected to because of the following informalities:

(a) On **page 1** at line 28, recitation of “.05N” should be changed to”**0.05N**” according to traditional wording.

(b) On **page 6** at line 37, recitation of “0.001-5” is better to change to” **0.001-5.0**” for clarification. Otherwise, it may mean 0.001 to 0.005.

(c) On **page 10** at line 6, recitation of “(CH₂CH₂)to” is improper. A change to “**(CH₂CH₂) to**” with a space is needed.

(d) On **page 1** at line 15, **page 2** at lines 24 and 31, **page 14** at line 6 and maybe throughout the specification, all recitations of “n>=1” should be changed to “**n >= 1**” with a space on both sides according to traditional wording.

Appropriate corrections for (a) - (d) are required.

Claim Objections

3. Claims 4, 13 and 16 are objected to because of the following informalities:

(a) On **Claim 4** at line 7, recitation of " $n \geq 1$ " should be changed to "**n** ≥ 1 " with a space on both sides according to traditional wording.

(b) On **Claim 13** at line 9 and **Claim 16** at line 18, a recitation of "**n** ≥ 1 " is needed to indicate the factor of n in the chemical formula since both Claims 13 and 16 are independent claims.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 13 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

On **Claim 13** at lines 5-6, the phrase of "less than ca. 12" is vague and indefinite. **It may mean a number below the level of 12+ or 12-.** Therefore, one of ordinary skill in the art

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would not be reasonably appraised of the scope of the invention. The examiner insists that it should be rewritten clearly with a phrase such as "less than 12".

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

- (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. The limitation of parent **Claim 4** relates to a polymer comprising monomer units of VF_2 and 1-40 mol % of ionic monomer units of $\underline{CH_2=CH-(CF_2)_{2n}-O-CF_2-CF_2-SO_2-X}$ where $n \geq 1$, X is OM^+ , or $N(M^+)SO_2R_f$ where M^+ is H^+ or an alkali metal cation and R_f is C1-4 perfluoroalkyl optionally substituted by one or more ether oxygens. Parent **Claim 13** relates to

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*a process of making $\text{CH}_2=\text{CH}-(\text{CF}_2)_{2n}-\text{O}-\text{CF}_2-\text{CF}_2-\text{SO}_3^-\text{M}^+$ from $\text{CH}_2=\text{CH}-(\text{CF}_2)_{2n}-\text{O}-\text{CF}_2-\text{CF}_2-\text{SO}_2-\text{F}$ with a base, while parent **Claim 16** relates to the conversion of $\text{CH}_2=\text{CH}-(\text{CF}_2)_{2n}-\text{O}-\text{CF}_2-\text{CF}_2-\text{SO}_2-\text{F}$ to the imide salt with $\text{R}_f\text{SO}_2\text{NH}_2$.*

*See other limitations of dependent **Claims 5-8 and 13-17**.*

7. Claims 4-8 and 13-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Drysdale et al. (WO 98/31716) in view of Howells et al. (WO 97/23448) and Krespan (US 4,349,650).

Regarding the limitation of parent **Claims 4 and 16**, Drysdale et al. have disclosed the preparation of the monomer of $\text{CH}_2=\text{CH}-(\text{CF}_2)_2-\text{O}-\text{CF}_2-\text{CF}_2-\text{SO}_2-\text{F}$ (page 5, line 1-17) as well as the grafting of polyethylene with such a monomer (page 5, line 18 – page 6, line 8). With respect to the limitation of parent **Claim 13**, Drysdale et al. have further disclosed the conversion of $\text{CH}_2=\text{CH}-(\text{CF}_2)_2-\text{O}-\text{CF}_2-\text{CF}_2-\text{SO}_2-\text{F}$ or its polymer to its form of sulfonic acid and its potassium salt by using KOH/THF/water (page 6, line 10-27).

8. The Drysdale reference is silent about two things as following: (A) the conversion of $\text{CH}_2=\text{CH}-(\text{CF}_2)_2-\text{O}-\text{CF}_2-\text{CF}_2-\text{SO}_2-\text{F}$ to the imide salt of $-\text{SO}_2-\text{N}^-(\text{M}^+)\text{SO}_2\text{R}_f$, and (B) copolymerizing such a imide-containing monomer with vinylidene fluoride (VF_2). **Howells et al.** teach the method of such a conversion by starting with $-\text{SO}_2-\text{F}$ containing monomer and $\text{R}_f\text{SO}_2\text{NH}_2$ into a **lithium salt of imide** and then forming the copolymers (see working examples in page 19, line 26 – page 21, line 9; abstract, line 4-5; page 20, line 16 for **$\text{CF}_3\text{SO}_2\text{NH}_2$** ;

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particularly see page 8 at line 28 and 31 for the equivalence of $\text{CH}_2=\text{CH}-$ and $\text{CF}_2=\text{CF}-$). By doing so, such a copolymer may be useful in making **battery electrolytes** with decreased corrosion (page 1, line 22-31). **Krespan** teaches that the monomer of $\text{CF}_2=\text{CF}-\text{CF}_2-\text{O}-\text{CF}_2-\text{CF}_2-\text{SO}_2-\text{F}$ can be copolymerized with ethylene or vinylidene fluoride (column 11, line 28-58; particularly see line 37 for ethylene and line 39 for vinylidene fluoride). By doing so, more desirable or new properties in comparison with PE, PTFE or PVDF can be obtained (column 11, line 47-50).

9. In light of the fact that (A): all the involved references are preparing the same or similar type of sulfonyl-containing copolymers as well as (B): $\text{CH}_2=\text{CH}-$ and $\text{CF}_2=\text{CF}-$ in such type of monomers are functionally equivalent and interchangeable. Therefore, one having ordinary skill in the art would have found it obvious to modify Drysdale's monomer of $\text{CH}_2=\text{CH}-(\text{CF}_2)_2-\text{O}-\text{CF}_2-\text{CF}_2-\text{SO}_2-\text{F}$ to the imide salt of $-\text{SO}_2-\text{N}^-(\text{M}^+)\text{SO}_2\text{R}_f$ and then to copolymerize with vinylidene fluoride as taught by Howells and Krespan. One advantage from this modification on functional group is to obtain more desirable or new properties in comparison with PE, PTFE or PVDF. The other advantage from interexchange of $\text{CH}_2=\text{CH}-$ and $\text{CF}_2=\text{CF}-$ is to obtain a copolymer useful in making **battery electrolytes** with decreased corrosion. Therefore, **a more diversified product may be thereby resulted.**

10. Regarding **Claim 5**, Krespan teaches that 5-55 wt% of such a sulfonyl-containing monomer can be used in making copolymers (column 11, line 59-62).

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Regarding **Claims 14 and 15**, Howells teaches that lithium carbonate in excess amount is used in the end of reaction when converting into the claimed imide salts (page 20, line 16 – page 21, line 1).

The remaining **Claims 6-8 and 17** are thereby rejected with the same reason for the above rejection of Claims 4-5 and 13-16.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicants' disclosure. The following references relate to a copolymer of VF_2 and $\text{CH}_2=\text{CH}-(\text{CF}_2)_{2n}-\text{O}-\text{CF}_2-\text{CF}_2-\text{SO}_2-\text{N}^-(\text{M}^+)\text{SO}_2\text{R}_f$ as well as a process of making $\text{CH}_2=\text{CH}-(\text{CF}_2)_{2n}-\text{O}-\text{CF}_2-\text{CF}_2-\text{SO}_3^-\text{M}^+$ from $\text{CH}_2=\text{CH}-(\text{CF}_2)_{2n}-\text{O}-\text{CF}_2-\text{CF}_2-\text{SO}_2-\text{F}$ with a base:

US Patent No. 5,463,005 to Desmarteau discloses the preparation of monomers, copolymers and membranes containing repeating units of $\text{CF}_2=\text{CF}-\text{R}_f-\text{NH}-\text{SO}_2-\text{R}_f$ (abstract, line 1-25; column 6, line 56 – column 8, line 36). However, Desmarteau does not teach or fairly suggest apply it to the $\text{CH}_2=\text{CH}-$ analogue as well as copolymerization with vinylidene fluoride. Therefore, Desmarteau fails to teach or fairly suggest the limitation of present invention.

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12. Any inquiry concerning this communication or earlier communication from the examiner should be directed to Henry S. Hu whose telephone number is (571) 272-1103. The examiner can be reached on Monday through Friday from 9:00 AM –5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu, can be reached on (571) 272-1114. The fax number for the organization where this application or proceeding is assigned is (703) 872-9306 for all regular communications.

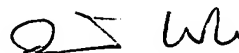
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Henry S. Hu

Patent Examiner, Art Unit 1713, USPTO

April 13, 2005



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